Claims

I claim:

1. A method of forming electrically conductive pathways, comprising the steps of:

providing a thermal transfer ribbon;

moving the thermal transfer ribbon past a heat source;

engaging the thermal transfer ribbon with a receiver substrate as the thermal transfer ribbon moves past the heat source;

selectively heating portions of the thermal transfer ribbon with the heat source; and

transferring a composition from the thermal transfer ribbon to the receiver substrate, the selective heating enabling a desired pattern of the composition to be transferred to the receiver substrate.

2. The method of forming electrically conductive pathways as recited in claim 1, wherein the composition transferred from the thermal transfer ribbon is an electrically conductive material.

3. The method of forming electrically conductive pathways as recited in claim 1, wherein the composition transferred from the thermal transfer ribbon is an electrical conductor precursor which becomes an electrically conductive material upon application of heat from the heat source.

4. The method of forming electrically conductive pathways as recited in claim 1, further comprising the step of using a thermal print head as the heat source.

5. The method of forming electrically conductive pathways as recited in claim 1, wherein the thermal transfer ribbon fails to have magnetic particles and wherein transfer of the composition occurs solely due to heating and contact of the composition with the receiver substrate.

6. The method of forming electrically conductive pathways as recited in claim 1, further comprising the step of combining the receiver substrate with a microchip to form an antenna.

7. The method of forming electrically conductive pathways as recited in claim 6, wherein the antenna is used as a radio frequency identification tag and further comprising the step of affixing the microchip to the receiver substrate either before or after the step of transferring the composition.

8. A radio frequency tag produced according to the method of claim 7.

9. The method of forming electrically conductive pathways as recited in claim 1, further comprising the steps of:

using a polymeric film or paper as the transfer ribbon;

coating the transfer ribbon with the conductive material and with at least one of wax, binders, surfactants and dispersants; and

using at least one of metallic inks, metallic substances, metallic dispersions, metallic salts, carbon based inks as the composition.

10. The method of forming electrically conductive pathways as recited in claim 9, further comprising the steps of:

using at least one of carnuaba wax, paraffin wax, low molecular weight polyethylene wax as the wax in the transfer ribbon; and

using at least one of styrene copolymers, polyethylene resin, polystyrene, vinyl chloride polymers, and vinyl acetate polymers as the binders in the transfer ribbon.

11. A method of forming electrically conductive pathways, comprising the steps of:

providing a substrate coated with reactive material;

moving the substrate past a heat source;

selectively heating portions of the substrate with the heat source; and

developing the reactive material on the substrate during exposure to heat from the heat source to develop a desired pattern on the substrate, the reactive material forming an electrically conductive material.

12. The method of forming electrically conductive pathways as recited in claim 11, further comprising the steps of:

using a cellulosic material, a polymeric film or paper as the substrate;

coating the substrate with the conductive material and with at least one of binders, surfactants and dispersants, the conductive material being a reducible material.

13. The method of forming electrically conductive pathways as recited in claim 12, further comprising the step of using at least one of sorbitol copper formate, copper sulfate, cuprite, tenorite and silver nitrate as reactive material which forms the electrically conductive material.

14. The method of forming electrically conductive pathways as recited in claim 12, further comprising the step of using at least one of styrene butadiene copolymers, polyvinyl alcohols, starch, vinyl chloride polymers, vinyl acetate polymers and methyl cellulose as the binders of the substrate.

15. The method of forming electrically conductive pathways as recited in claim 11, further comprising the step of using a thermal print head as the heat source.

16. The method of forming electrically conductive pathways as recited in claim 11, further comprising the step of combining the substrate with a microchip to form an antenna.

17. The method of forming electrically conductive pathways as recited in claim 16, wherein the antenna is used as a radio frequency identification tag and further comprising the step of affixing the microchip to the receiver substrate either before or after the step of transferring the composition.

18. A radio frequency tag produced according to the method of claim 17.

19. A system for producing radio frequency tags comprising:

a conveyor for moving a substrate;

a thermal print ~~heat~~ head, the conveyor moving the substrate past the thermal print ~~heat~~ head, the thermal print head being selectively actuatable to heat a desired pattern on the substrate;

means on the substrate for reacting with the heat source to form electrically conductive pathways, the means including a heat sensitive composition on the substrate.

20. The system for producing radio frequency tags as recited in claim 19, wherein the substrate is a thermal transfer ribbon and wherein the conveyor further conveys a receiver substrate past the heat source, the receiver substrate and the thermal transfer ribbon being engaged at the thermal print head and the heat sensitive composition being initially provided on the thermal transfer ribbon being heated in the desired pattern by the thermal print head and thereafter being transferred to the receiver substrate, the heat sensitive composition which is not heated by the thermal print head remaining on the thermal transfer ribbon, the heat sensitive composition transferred to the receiver substrate forming electrically conductive pathways on the receiver substrate.

21. The system for producing radio frequency tags as recited in claim 20, further comprising a device for applying a microchip onto the receiver substrate with the electrically conductive pathways to form a radio frequency tag.

22. The system for producing radio frequency tags as recited in claim 19, wherein the heat sensitive composition on the substrate includes at least one of metallic inks, metallic substances, metallic salts, metallic dispersions and carbon based inks.

23. The system for producing radio frequency tags as recited in claim 19, wherein the heat sensitive composition on the substrate is at least one of sorbitol copper formate, copper sulfate, cuprite, tenorite and silver nitrate and wherein the thermal print head only reacts with the heat sensitive composition in the desired pattern to form the electrically conductive pathways with the reacted heat sensitive composition while unreacted heat sensitive composition remains on the substrate.

24. The system for producing radio frequency tags as recited in claim 23, further comprising a device for applying a microchip onto the receiver substrate with the electrically conductive pathways to form a radio frequency tag.